ENEE 719B: Advanced Power Electronics – Course Outline

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Grading: **TBA**

Class hours: **TBA**

Office hours: **TBA**

Course Description:

Advanced power electronic converters, techniques to model and control switching circuits, pulse width modulation, resonant switch converters, resonant DC-link converters, series and parallel loaded resonant (SLR, PLR) DC-DC converters, zero-voltage switching clamped-voltage (ZVS-CV) converters, ZVS resonant-switch DC-DC converters are explained. In addition, this course deals with small-signal and large-signal modeling and control of switched mode power converters, sliding-mode operation, state space models, generalized state-space averaging, and feedback linearization techniques. Multiple-input converters and their operational principles are explained. Furthermore, practical design procedures for type II and type III compensators with voltage-mode error-amplifier for DC/DC converters are explained.

Course Purpose:

There is a growing demand towards power electronic switching circuits in a broad variety of applications from low-power personal computers, laptops, digital cameras, cell phones, home appliances, to medium-power telecommunication systems, switching power supplies, hybrid electric, plug-in hybrid electric vehicles, more electric aircrafts, sea vehicles, undersea vehicles and industrial motor drives, to high-power active filters, renewable (Solar, wind, and ocean) energy systems, and flexible AC transmission systems for terrestrial power systems. In fact, power electronics provides the basis for a variety of new electrical circuit architectures that allow substantial improvements in performance and flexibility. The purpose of this course is to present the advanced topics in power electronics.

Course Text:

There is no textbook. Instructor will use technical papers and notes. The following books can be used as reference.

[1] J. G. Kassakian, M. F. Schlecht, and G. C. Verghese, *Principles of Power Electronics,* Addison-Wesley Publishing Co., Reading, MA, 1991.
[2] A. Emadi, A. Khaligh, Z. Nie, and Y.-J. Lee, *Integrated Power Electronics Converters and Digital Control,* Boca Raton, FL: CRC Press, ISBN: 978-1-4398-0069-0, May 2009.
[3] J. P. Agrawal, *Power Electronic Systems Theory and Design,* Prentice Hall PTR, Upper Saddle River, NJ, 2001.
[4] P. T. Krein, *Elements of Power Electronics,* Oxford University Press, New York, NY, 1998.
[5] N. Mohan, T. M. Undeland, and W. Robbins, *Power Electronics: Converters, Applications, and Design*, Media Enhanced 3rd Edition, John Wiley & Sons, Inc., 2003.
[6] D. Hart, *Power Electronics*, Jan. 2010.